

1     Claims

2  
3             1.       A lift station for lifting liquid from an open channel flow of liquid, said lift  
4     station comprising:

5                     a housing having an inlet opening arranged to receive said open channel flow of  
6     liquid onto a bottom wall of said housing so that open channel flow continues into said housing:

7                     a bladed wheel mounted within said housing for rotation about an axis located  
8     above said inlet opening, and a drive motor rotating said bladed wheel therein by drive  
9     components coupling said drive motor to said blade wheel;

10                    said bladed wheel having a plurality of outwardly extending blades attached to a  
11    hub structure, said blades generally conforming to the cross sectional shape of an interior space  
12    in said housing receiving said open channel liquid flow and rotated in the same direction of the  
13    direction of said flow, said blades each having an outer edge passing over said bottom wall  
14    during rotation of said bladed wheel and sweeping said open channel liquid flow entering said  
15    inlet opening in said same direction as said direction of said open channel flow;

16                    said housing interior space defined by a rear wall surface curving upwardly from  
17    said inlet opening along the path along which said outer edge of each of said blades move so as  
18    to enable liquid to be swept therealong and upwardly by rotation of said bladed wheel;

19                    said upwardly curving surface extending to a rearwardly and upwardly extending  
20    exit chute having a weir edge defined at an upper region thereof, liquid slung over said weir edge  
21    descending into a collection space disposed below and past said weir edge; said bladed wheel  
22    rotated by said drive motor to achieve sufficient blade velocity to sweep liquid upwardly and to

1 sling said liquid up said exit chute and over said weir edge, said liquid thereafter descending into  
2 said collection space;

3 the improvement comprising an entryway inclined downwardly sufficiently  
4 steeply to said housing bottom wall inlet opening in the direction of movement of said blades to  
5 prevent a substantial retardation of said open channel flow upon encountering said blades.

6  
7 2. The lift station according to claim 1 wherein said housing bottom wall  
8 descends approximately three inches to a point where said flow encounters said rotating wheel  
9 blades.

10  
11 3. The lift station according to claim 1 wherein said housing further includes  
12 an upwardly inclined guide partition extending from said weir edge back into said housing to  
13 guide said liquid slung up by said wheel blades over said weir edge.

14  
15 4. The lift station according to claim 1 wherein said hub structure comprises  
16 a drum, said blades attached to the perimeter thereof extending in a tangential direction; an axle  
17 shaft fixed to and extending within said drum; a respective bearing receiving one end of said axle  
18 shaft mounted to the inside of a respective side wall defining said housing to support said blade  
19 wheel for rotation in said housing interior space.

20  
21 5. The lift station according to claim 4 wherein said respective bearing  
22 comprises a roller bearing filled with a solid lubricant.

1                   6.       The lift station according to claim 1 further including a reverse rotation  
2 device drivingly associated with said bladed wheel preventing rotation thereof in a reverse  
3 direction from said direction of open channel liquid flow into said housing.

4  
5                   7.       The lift station according to claim 6 wherein said reverse rotation device  
6 comprises a one way sprag clutch driven by a drive shaft driven by said drive motor and a  
7 reaction arm connected to fixed structure and absorbing a reaction of said sprag clutch upon  
8 attempted reverse rotation of said bladed wheel.

9  
10                  8.       The lift station according to claim 1 wherein each blade is constructed of  
11 two thin metal sheets clamped together, one blade sheet extending out radially a greater distance  
12 than the other blade sheet.

13  
14                  9.       A method of raising the level of liquid in an open channel flow of liquid  
15 flowing down an inclined bottom collection trough extending beneath a machine tool installation  
16 to collect draining cutting fluid and entrained chips to form an open channel liquid flow stream  
17 within said collection trough, comprising the steps of:

18                         guiding said open channel liquid stream in said collection trough into a housing  
19 having a bottom surface configured to receive said flowing liquid stream;

20                         successively sweeping each of a plurality of blades into said flowing liquid stream  
21 to sweep liquid and chips along said housing bottom surface and up an upwardly curving wall  
22 surface into an exit chute extending back in a reverse direction from said flowing liquid stream,

1 and over a weir edge located in said exit chute;

2 causing said open channel flow stream to plunge down into the region whereat  
3 blades sweep into said flow stream through a vertical drop sufficient to prevent a substantial  
4 disturbance in said open channel flow upstream from said region whereat said blades sweep into  
5 said flow.

6  
7 10. The method according to claim 9 wherein said vertical drop comprises a  
8 distance approximately three inches to cause a sufficient increase in flow to prevent said  
9 upstream disturbance.

10  
11 11. A lift station for lifting liquid from an open channel flow of liquid, said lift  
12 station comprising:

13 a housing having an inlet opening arranged to receive said open channel flow of  
14 liquid onto a bottom wall of said housing so that open channel flow continues into said housing:

15 a bladed wheel mounted within said housing for rotation about an axis located  
16 above said inlet opening, and a drive motor rotating said bladed wheel therein by drive  
17 components coupling said drive motor to said blade wheel;

18 said bladed wheel having a plurality of outwardly extending blades attached to a  
19 hub structure, said blades generally conforming to the cross sectional shape of an interior space  
20 in said housing receiving said open channel liquid flow and rotated in the same direction of the  
21 direction of said flow, said blades each having an outer edge passing over said bottom wall  
22 during rotation of said bladed wheel and sweeping said open channel liquid flow entering said

1 inlet opening in said same direction as said direction of said open channel flow;

2 said housing interior space defined by a rear wall surface curving upwardly from  
3 said inlet opening along the path along which said outer edge of each of said blades move so as  
4 to enable liquid to be swept therealong and upwardly by rotation of said bladed wheel;

5 said upwardly curving surface extending to a rearwardly and upwardly extending  
6 exit chute having a weir edge defined at an upper region thereof, liquid slung over said weir edge  
7 descending into a collection space disposed below and past said weir edge; said bladed wheel  
8 rotated by said drive motor to achieve sufficient blade velocity to sweep liquid upwardly and to  
9 sling said liquid up said exit chute and over said weir edge, said liquid thereafter descending into  
10 said collection space;

11 the improvement comprising a reverse rotation device drivingly associated with  
12 said bladed wheel preventing rotation thereof in a reverse direction from said direction of open  
13 channel liquid flow into said housing.

14  
15 12. A lift station for lifting liquid from an open channel flow of liquid, said lift  
16 station comprising:

17 a housing having an inlet opening arranged to receive said open channel flow of  
18 liquid onto a bottom wall of said housing so that open channel flow continues into said housing:

19 a bladed wheel mounted within said housing for rotation about an axis located  
20 above said inlet opening, and a drive motor rotating said bladed wheel therein by drive  
21 components coupling said drive motor to said blade wheel;

22 said bladed wheel having a plurality of outwardly extending blades attached to a

1 hub structure, said blades generally conforming to the cross sectional shape of an interior space  
2 in said housing receiving said open channel liquid flow and rotated in the same direction of the  
3 direction of said flow, said blades each having an outer edge passing over said bottom wall  
4 during rotation of said bladed wheel and sweeping said open channel liquid flow entering said  
5 inlet opening in said same direction as said direction of said open channel flow;

6 said housing interior space defined by a rear wall surface curving upwardly from  
7 said inlet opening along the path along which said outer edge of each of said blades move so as  
8 to enable liquid to be swept therealong and upwardly by rotation of said bladed wheel;

9 said upwardly curving surface extending to a rearwardly and upwardly extending  
10 exit chute having a weir edge defined at an upper region thereof, liquid slung over said weir edge  
11 descending into a collection space disposed below and past said weir edge; said bladed wheel  
12 rotated by said drive motor to achieve sufficient blade velocity to sweep liquid upwardly and to  
13 sling said liquid up said exit chute and over said weir edge, said liquid thereafter descending into  
14 said collection space;

15 the improvement comprising a housing tray affixed to a side wall of said housing  
16 said drive motor mounted thereon with a drive component coupling said bladed wheel thereto to  
17 cause said rotation of said wheel.

18  
19 13. The method according to claim 12 wherein said motor is mounted  
20 vertically in said housing tray.

21  
22 14. The method according to claim 12 wherein said drive components include

1 a drive shaft penetrates said side wall of said housing.

2

3 15. The method according to claim 14 wherein said housing tray has a bottom  
4 wall sloping toward said housing side wall and a drain hole in said side wall allowing drawback  
5 of any liquid leaking into said housing tray.